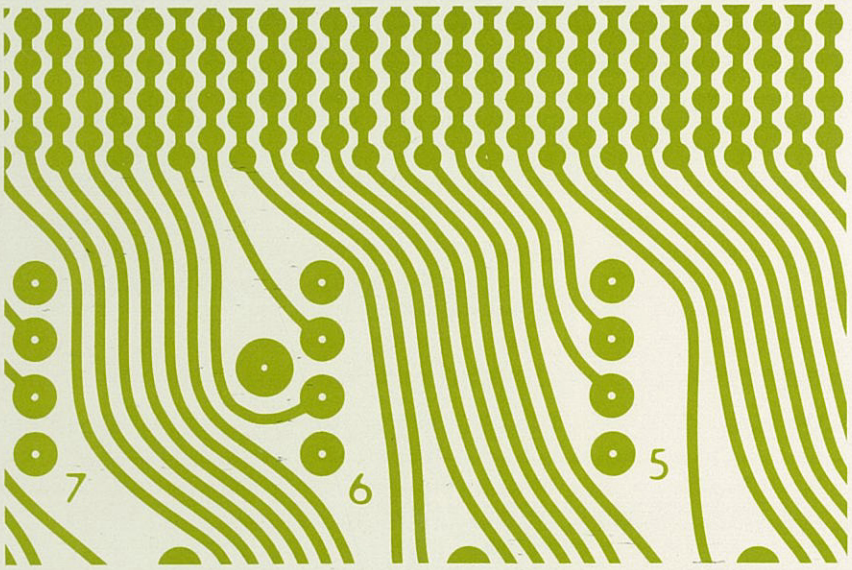
MICRO SWITCH
PRODUCT BROCHURE SW

Solid State Keyboards



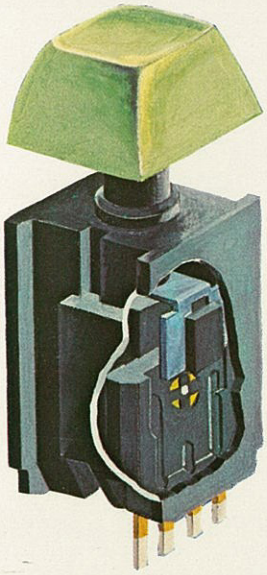


Table of Contents

INTRODUCTION 3

TECHNOLOGY 4
- Solid State Switch Modules
- Operating Characteristics
- Switch Mounting and Termination
- Buttons
- Button Orientation
- Encoding

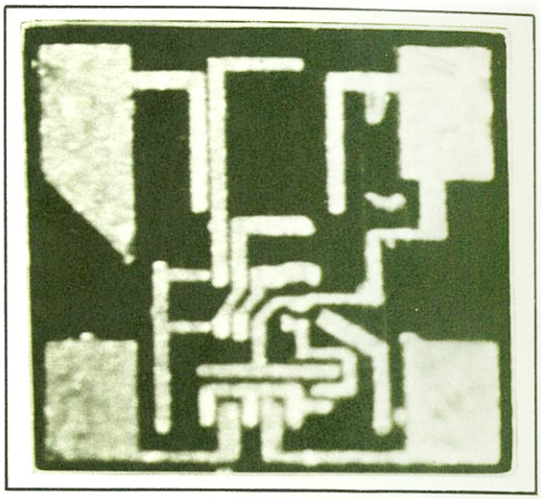
FLEXIBILITY 7
- Arrays
- Buttons
- Codes
- Electronic Interlocks
- Shiftlock
- Repeat
- System Control
- Strobe
- Parity
- One-character Storage
- Multiple Character Memory
- Strobe Enable
- System Interface

RELIABILITY 9

QUALITY 10

CAPABILITY 11

STOCK LISTINGS 12



Introduction

Our solid state keyboards are performing reliably in thousands of applications. Typical uses are typesetting, factory automation, point-of-sales, communications and source data equipment. Here are at least five good reasons why:

Technology We selected the Hall effect solid state switch because of its simplicity, reliability and overall economy. And our encoding techniques let us match the exact code you need at a reasonable price. Even if your requirements call for a keyboard that generates totally unrelated codes, we can supply it. We have built keyboards where each key generates six levels of code! Our extensive human factors research has led to a keyboard design that is comfortable and natural to the operator. Because that's the secret to maximum throughput.

Flexibility No matter if your keyboard calls for 12 or over 212 stations, we can build it. In the configuration that you tell us. Our factory-based application engineers will come directly to your location to work out the details. Once the requirements are transmitted back to our factory, a design team will lay it all out to meet your exact requirements. So you only pay for what you need.

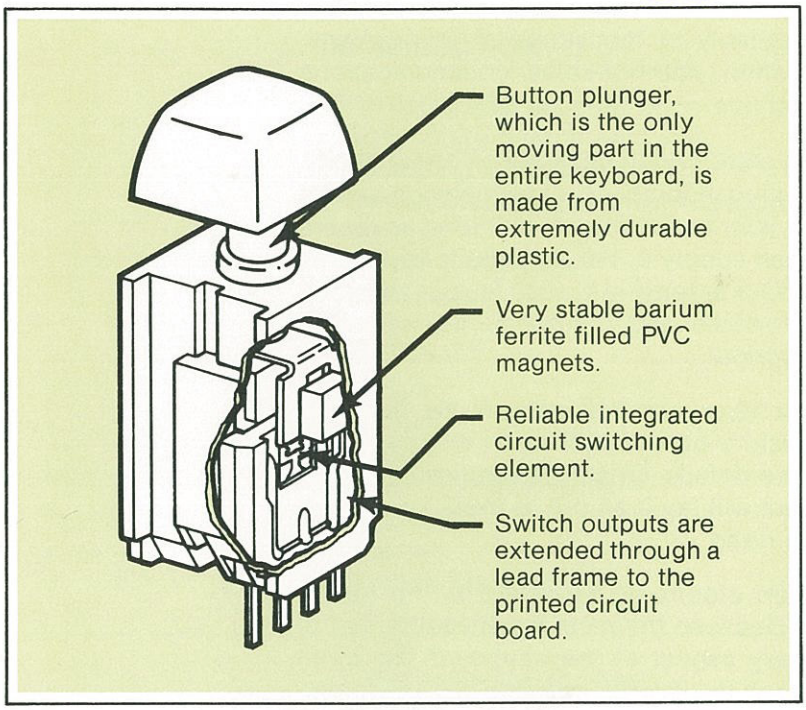
Reliability The most important element of an electronic keyboard is the switch module. This is why we selected solid state. Because the most troublesome part of the switch is eliminated... the contacts. Every aspect of the keyboard has been selected for high reliability. Our encoding uses the fewest possible discrete components. The inherent reliability of our keyboards has been confirmed by extensive laboratory testing. But, more importantly, our keyboards have been proven by tens of thousands of units in everyday use. Many since 1968. And MICRO SWITCH keyboard reliability is going to save you money because you will have to make fewer service calls. Plus your customers will be happier because they will have less downtime.

Quality A complete quality procedure has been established for every step of production. And equipment has been designed to make checks all along the way. Exclusive automated equipment conducts final inspections. We call it CAKE (Computer Assisted Keyboard Evaluator). With CAKE conducting final inspection, the chance for human error is eliminated. With this thorough inspection a 1% AQL is possible. So you need only sample inspect each keyboard shipment. This means you're going to save money on incoming inspections.

Capability Our manufacturing facility is geared to make high quality keyboards by the thousands. It cost a lot of money to build this capability and required some pretty special people to design the unique equipment needed. But, we're now able to meet your high volume requirements, quickly. And high volume means lower per-unit pricing whether you want one or ten thousand keyboards.

This brochure describes the features and options available with our SW Series keyboards. We are ready to work with you in specifying a keyboard that is tailored to the exact requirements of your application. For prototypes, low volume production and evaluation purposes there are several stock listings given at the end of this brochure. Call your nearest MICRO SWITCH branch office today for complete assistance.

Technology


Button plunger, which is the only moving part in the entire keyboard, is made from extremely durable plastic.
Very stable barium ferrite filled PVC magnets.
Reliable integrated circuit switching element.
Switch outputs are extended through a lead frame to the printed circuit board.

The selection of components and materials has been made so they will compliment each other. This is to achieve all of our objectives for reliability and long life. You can expect our keyboards to last a long, long time. And you won't be plagued with numerous irritating failures either.

SOLID STATE SWITCH MODULES

The Hall effect solid state switch pioneered and developed by MICRO SWITCH is one of the most reliable switching elements ever designed. This switch is the heart of every key on the keyboard.

Our modules are available in the following variety of electrical and mechanical configurations including:

- Level or pulsed outputs
- Sourcing or sinking outputs
- One or two levels of output
- Momentary or alternate action
- Lighted or non-lighted

SWITCH MODULE OPERATING CHARACTERISTICS

	MOMENTARY	ALTERNATE ACTION
Total Travel (in.)	0.187 Nom.	0.250 Nom.
Force at operating point	3 oz. Nom.	4.5 oz. Nom.
Pretravel (in.)	0.100 Nom.	0.100 Nom. (Latch at 0.165 Nom.)
Release point (in.)	0.040 Min.	0.040 Min.

The operating characteristics of our keyboard modules were selected for high operator throughput. They are similar to those found on the highest quality office typewriters. We can also supply modules with either higher or lower operating forces.

Note: When buttons larger than one-unit are used we provide support modules in addition to the switch modules. Balanced springs are used so the operating forces are compatible with single-unit buttons.

SWITCH MOUNTING AND TERMINATION

Rigid stainless steel mounting hardware is used to support switch modules. Thus the shock of key operation is not transmitted to the termination board and solder connections. The possibility of failure as the result of solder joint fatigue is virtually eliminated.

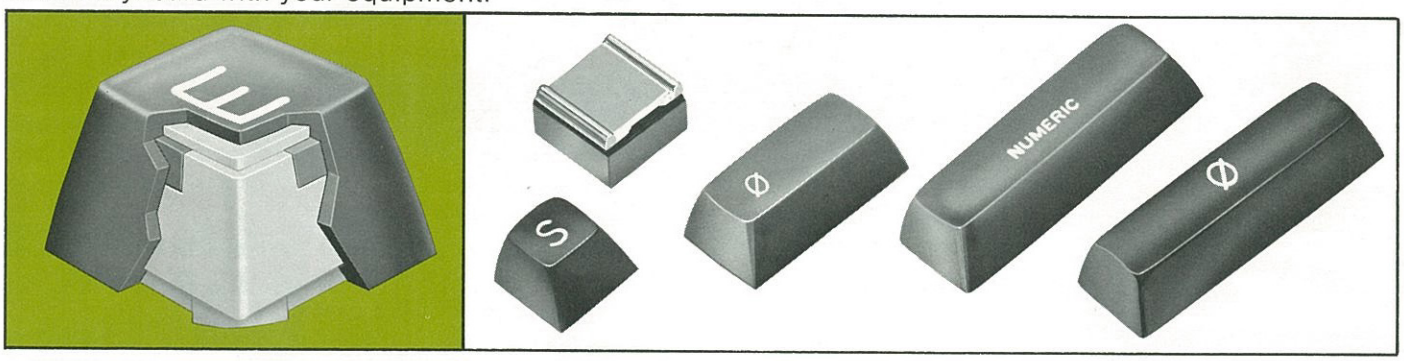
The switch mounting design allows almost complete array flexibility. It also insures good button alignment between stations and between rows.

Switches and associated electronic components are terminated to printed circuit boards (glass epoxy Nema Grade FR-4, and UL listed). Glass epoxy has been selected because it combines dimensional stability under adverse environmental conditions with excellent mechanical and electrical properties.

Glass epoxy printed circuit board
Stainless steel mounting hardware
Switch mounting design allows almost complete array flexibility

BUTTONS

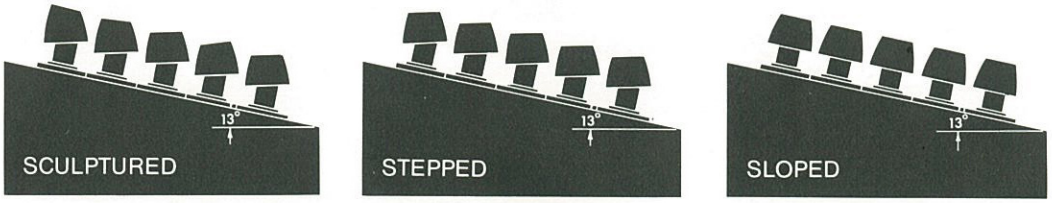
We have the largest selection of buttons in the keyboard industry. All buttons are either double-shot or tri-shot molded to ensure attractive durable legends. With this technique, the legend can never wear away and there are no depressions in the legend area to fill with dirt. Thousands of legends have been tooled and we have the in-house capability to tool any special legends you may require. A variety of button shapes and sizes is available to meet virtually any special need. And a rainbow of standard colors for buttons and legends is available. Buttons may be specified with either a glossy or matte finish. We also offer sculptured buttons to provide a contoured typing surface. The top surface of each row of buttons is molded at a slightly different angle to form a dished effect similar to that found on some high quality office typewriters. (In fact, we can supply a duplicate array of the IBM Selectric.) This feature adds to operator comfort as well as the appearance of the keyboard with your equipment.



BUTTON ORIENTATION

We offer stepped, sloped, or sculptured key arrangements. These terms refer to the angle of the button in relationship to horizontal. The sloped key arrangement is 13 degrees to horizontal, while in stepped configurations the keytops are orientated horizontal as shown below.

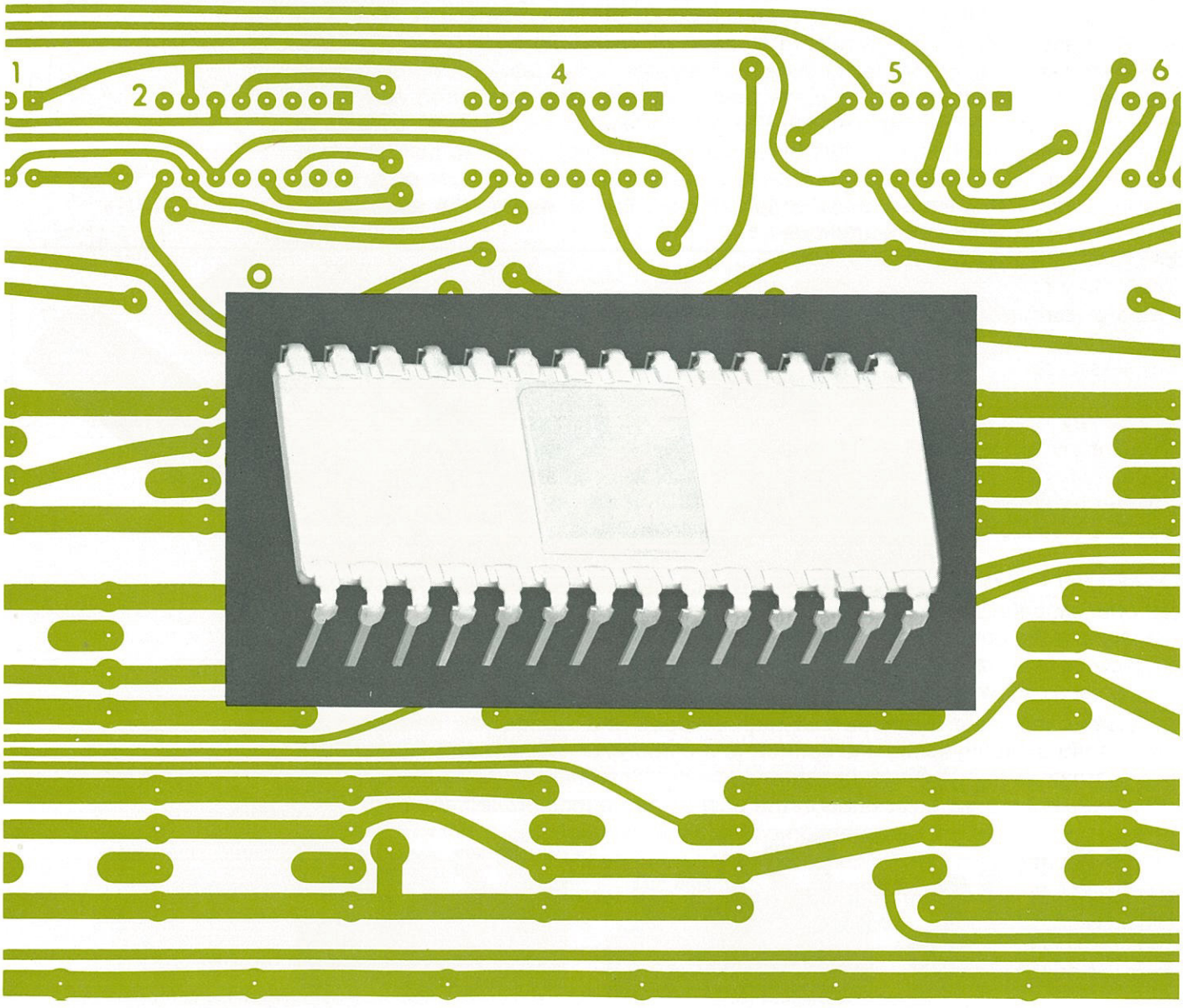
All evidence to date indicates that both stepped and sloped key arrangements provide equal typing speed and comfort to the operator. The stepped arrangement had its origin in the typewriter industry because of mechanical design. Sloped key rows have been used most often in the past on key punch equipment.



ENCODING

A unique two-of-n code is developed from the two isolated outputs available from each key switch. This code is used to address the keyboard encoder, thus eliminating the need for complex and costly scanning techniques.

We offer a great deal of flexibility in providing codes that meet your exact needs. With MOS (large scale integration), a variety of electronic options is available which can simplify your system as well as increase its versatility. Where encoding and system requirements are less complex, TTL (medium scale integration) encoding is used. Our encoding techniques can generate any code that you specify and in the number of modes necessary for your system. Totally unrelated codes may be generated by the same keys. For instance, a keyboard may be specified that generates two modes of USASCII and two modes of EBCDIC. Since we do not have to logically pair our encoding for multi-mode operation, you may pair characters in any way you choose. And for quick turnaround on prototypes and low volume orders we have programmable ROMs. So you can have your exact code required without long delays for new encoded designs. In other words, with our encoding techniques there are almost no limitations.



Flexibility

Our predesigned options give us the flexibility to meet a variety of requirements. In this way we can provide the features necessary for your application without long delays or expensive engineering charges.

ARRAYS We can supply keyboards in configurations to meet virtually any of your requirements. Including block arrays, offset arrays, and combination of both block and offset.

BUTTONS Buttons are available in a wide selection of sizes, shapes, and colors. We offer thousands of legends and we have economical in-house capability to tool any new legends you may require. We also supply foreign language characters such as Japanese (KATA KANA), Hebrew, Russian (Cyrilic), Swedish, Finnish, Spanish, German, French, Italian and a lot more.

CODES We can supply keyboards that generate any code that you specify and in the number of modes necessary for your system. Tell us what you need and we will supply it.

ELECTRONIC INTERLOCKS N-Key Rollover N-key rollover is a multiple key interlock similar to that found in most electric typewriters. MICRO SWITCH's method of accomplishing N-key rollover is a new concept. Our approach incorporates a pulsed output from each data key. This short duration output sets the data into the one-character memory where it remains until the pulse from the next key depressed sets new data into the memory. As opposed to two-key rollover, N-key rollover depends only on the down stroke of key operation. The sequence of key-release does not effect the data entry. Thus, the operator is not restricted by the requirements of releasing a previously depressed key before depressing another key.

The N-key rollover feature contributes to increased operator throughput by reducing the error rate. A human factors study, conducted by Honeywell Systems and Research Division, indicated a reduction of up to 30% in errors for operators using keyboards equipped with N-key rollover as compared with operators using conventional two-key rollover equipped keyboards.

Two-Key Rollover If your requirements do not call for N-key rollover, a two-key rollover electronic interlock may be provided. With two-key rollover the output is blocked when two or more keys are depressed at the same time.

SHIFTLOCK We offer three types of shiftlock:

Secretary Shift With this approach the operator strikes the shiftlock key to put the keyboard into the shifted mode and returns to the unshifted mode by operating the left or right hand shift key. A mechanical bail releases shiftlock. This is another way we duplicate the operation of a typewriter.

Alternate-Action The alternate-action key, when operated, remains visible below the level of the other unoperated keys. This tells the operator that the keyboard is in the shifted mode. The keyboard is returned to the unshifted mode by operating the alternate-action shiftlock key a second time.

Electronic Shiftlock Our third approach is an electronic shiftlock. When the shiftlock key is depressed the keyboard is put into the shifted mode and it will remain in this mode until either shift key is depressed and released. The shiftlock key may be lighted to give the operator a visual indication of keyboard status.

REPEAT: We offer three approaches for repeat:

Bi-level This approach is very similar to the repeat operation of an electric typewriter. When an operator types with normal pressure, the key force/displacement

characteristics are similar to those of non-repeating keys. When the operator wishes to repeat a character, she depresses the key to a lower position. There is a higher operating force between level one and level two to prevent accidental operation. A repeated strobe signal is generated using special circuitry in the keyboard electronics. The strobe signal will be repeated at a predetermined rate until the key is released.

Repeat key With this approach one key on the keyboard is assigned as the "Repeat Key." It is depressed in conjunction with any key that you wish to be repeated. The strobe signal will be repeated until either the data key or the "repeat" key is released. This method of repeat operation is desirable where all of the encoded keys on the keyboard require a repeat feature.

Timed repeat The keys that you specify for repeat with this approach will operate the same as other data keys, except when they are held depressed for at least ½ second (or the delay you specify) the strobe signal will repeat until the operator releases the key. This method may be used for all data keys or for selected keys that you specify.

Our repeat options can make your equipment more versatile at a relatively low cost. CRT's, printers, and other types of communication equipment can benefit from these options.

SYSTEM CONTROL This option allows the system program to select the keyboard mode of operation, in addition to the normal manual selection. This feature is especially useful when data is entered in a format.

STROBE A strobe signal can be provided with any of our encoding techniques. And the signal may be specified as a pulsed or level output.

PARITY Odd or even parity bits can be specified for any code. The parity bit can be used as a check bit.

ONE-CHARACTER STORAGE This option allows a character to be held in the output register until the next key depression or the system has read the data, depending on the control logic required.

MULTIPLE CHARACTER MEMORY This option allows uninhibited keyboard entry speeds without loss of data. The keyboard retains, in sequential registers, those burst speed characters that are generated faster than can be accepted by the low transmission rates of sub-voice band channels, or as limited by the speed of the system. These rates are sometimes as low at 10 cycles-per-second for data transmission channels.

STROBE ENABLE The data strobe may be controlled by the system or by use of internal circuits. This permits control of the one-character memory for applications where the keyboard is temporarily disabled or where the keyboard output timing is synchronized with system scanning rates.

SYSTEM INTERFACING We offer a number of options to make our keyboard output compatible with your system. Our engineering department is prepared to work with you to meet any special requirements you may have.

Voltage Regulators We can supply regulators for 6, 8, 12 and 15 volts DC and 24 volts AC.

Lamp Drivers With this option the solid state switches can be used with lamp circuits. This is especially useful where operator feedback is supplied through light indicators.

Line Drivers Additional output capacity can be supplied for long distance data transmission.

Parallel-to-Serial Converters If your requirements call for transmission of data over communication lines, a parallel-to-serial converter will be a useful option. Since the code for a given key is generated in parallel (all bits generated at the same time) the converter reads each bit one at a time and transmits them to the receiving equipment. In addition, start and stop signals are generated so that the receiving system can tell when the code for a new character is starting. We can supply keyboards with converters that will meet any bits-per-second rate you require.

Reliability

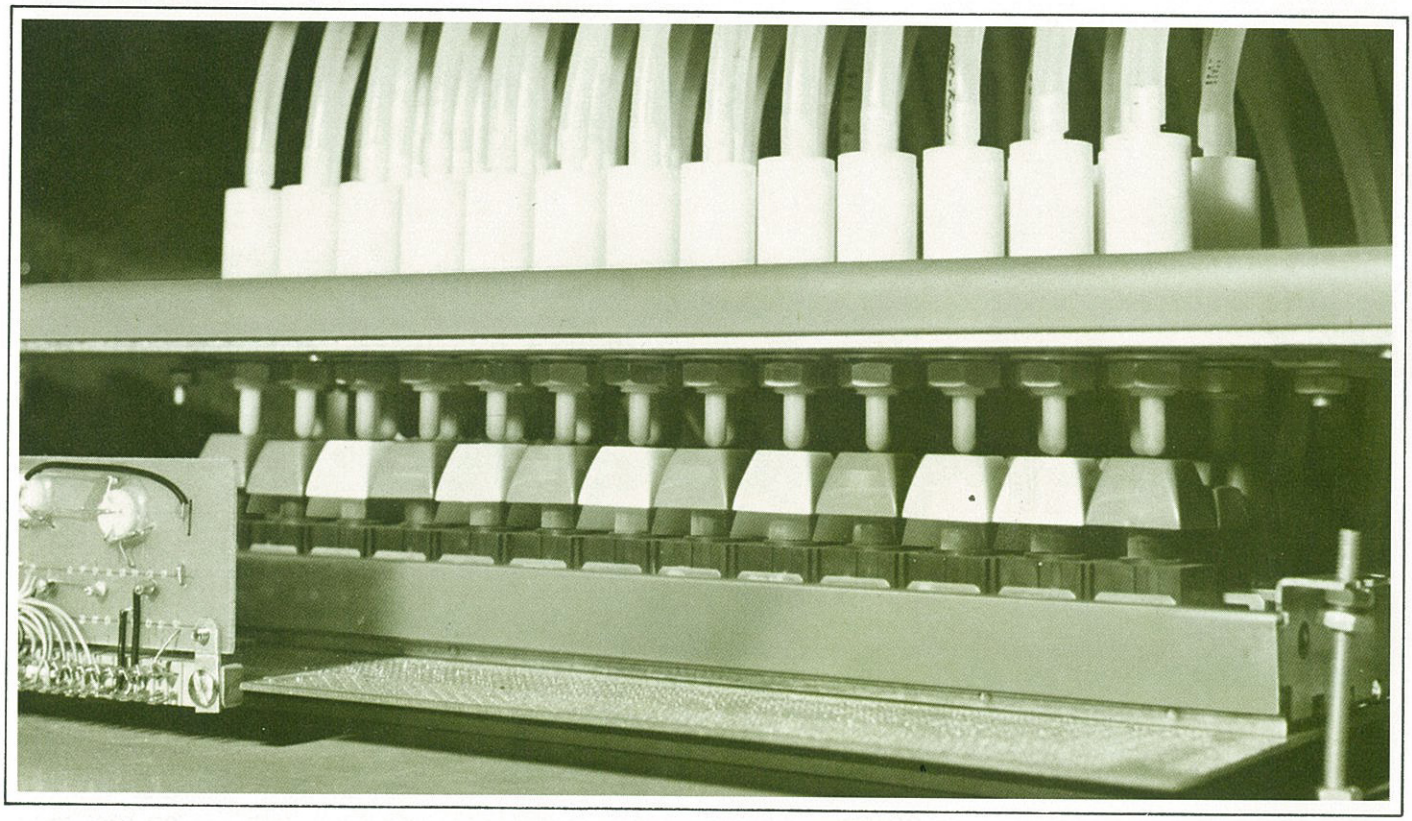
The reliability of our keyboards will save you money in reduced service calls. Plus it can increase goodwill with your customers since they are going to have less downtime. To show our confidence in our keyboards we have doubled our warranty period from 12 to 24 months.

The design of our keyboards is sound and simple to ensure reliability. The single most important element of an electronic keyboard is the switch module. This is why we selected the Hall effect solid state approach. It eliminates the most troublesome part of the switch—the contacts. That's because contacts bounce, contaminate, and oxidize. And all this leads to intermittent switching. In our evaluation of 90 solid state switch modules, they accumulated 20 billion operations with only one failure (a bonding wire fractured at 99 million operations)!

The keyboard design uses a minimum of discrete electronic components. On MOS keyboards, all encoding and electronic functions are usually performed on one chip. And most of our keyboards use only one printed circuit board for switch termination and keyboard electronics. This eliminates troublesome circuit board interconnections.

All materials used in MICRO SWITCH keyboards have been selected to insure reliability. This is why we use such things as stainless steel mounting hardware, glass epoxy circuit boards, and double-shot molded buttons.

The inherent reliability of our keyboards has been confirmed by extensive laboratory testing. For instance, a test conducted on a 52-key keyboard had an indicated mean time before failure of 11,000 hours. More importantly, our keyboards have been proven by tens of thousands of units in everyday use, many since 1968. We have on file at our Freeport, Illinois headquarters objective evidence of testing.



To prove the reliability of the design, every aspect of the keyboard is tested. Our test lab has specially designed keyboard evaluation equipment, such as this autotypist. It's been operating the keyboard around the clock, hammering out millions of operations to simulate years of normal keyboard use.

Quality

We have established a quality program that covers every aspect of the keyboard. This starts with design concept and extends through a complete computerized final inspection. Our keyboards are 100% electrically tested at room temperature and at 125° F. Every keyboard is visually inspected for solder joints, component values, button placement and all workmanship details.

The final inspection is conducted by our computer assisted keyboard evaluator. This equipment was designed and built by MICRO SWITCH personnel, and has been featured in leading business publications. It not only performs final inspections at least six times faster than previous techniques, but also is much more accurate. Among parameters checked for each key are proper code, rise and fall times, operating characteristics, plus current and voltage levels.

Because of our comprehensive quality procedure we are able to offer a 1% AQL (acceptable quality level). With the 1% AQL you need only sample inspect each shipment. This could mean a savings to you by reducing the inspections conducted by your receiving inspection department. Our research has shown that the cost of inspection can be as much as twelve dollars a keyboard. This savings is an important consideration when selecting a keyboard vendor. Our quality program also means that when you receive keyboards, they are ready to install . . . without problems.

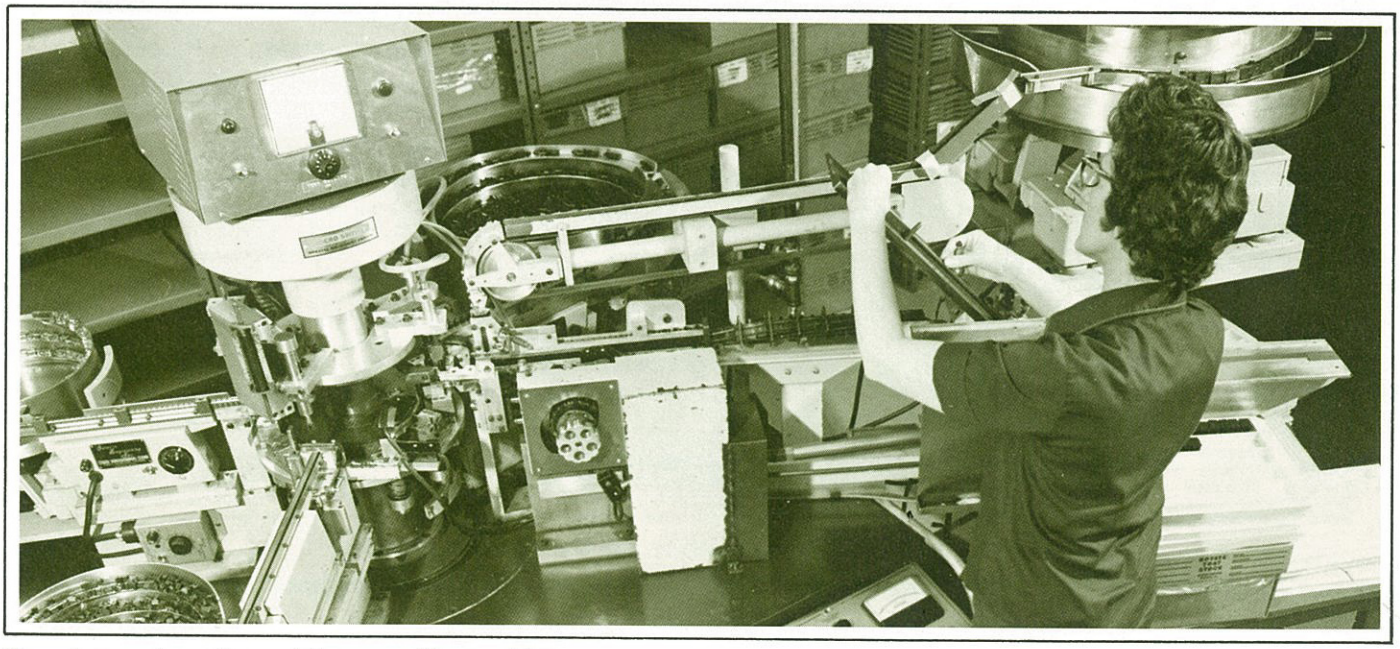
Final inspection is conducted by CAKE. Here both static and dynamic parameters are measured.

Capability

Our manufacturing is set up to make high quality keyboards by the thousands. A big capital investment has been made in order to do this. And much of our equipment was designed and built by our own personnel. That's because there simply was nothing on the market available to do the job. This includes automatic module assembly, solid state chip handling and quality checking equipment.
To evaluate the keyboard design we have a complete engineering test laboratory. This includes monitoring as well as environmental testing equipment. Billions of cycles have been recorded and everything from high speed photography to simulated typists are used to prove the design.
In addition to our domestic plants, we have manufacturing facilities located in both Europe and the Far East.

Printed circuit board assembly area.

A specially designed die placement machine is used to handle chips.



One of our automatic module assembly machines.

Stock Listings

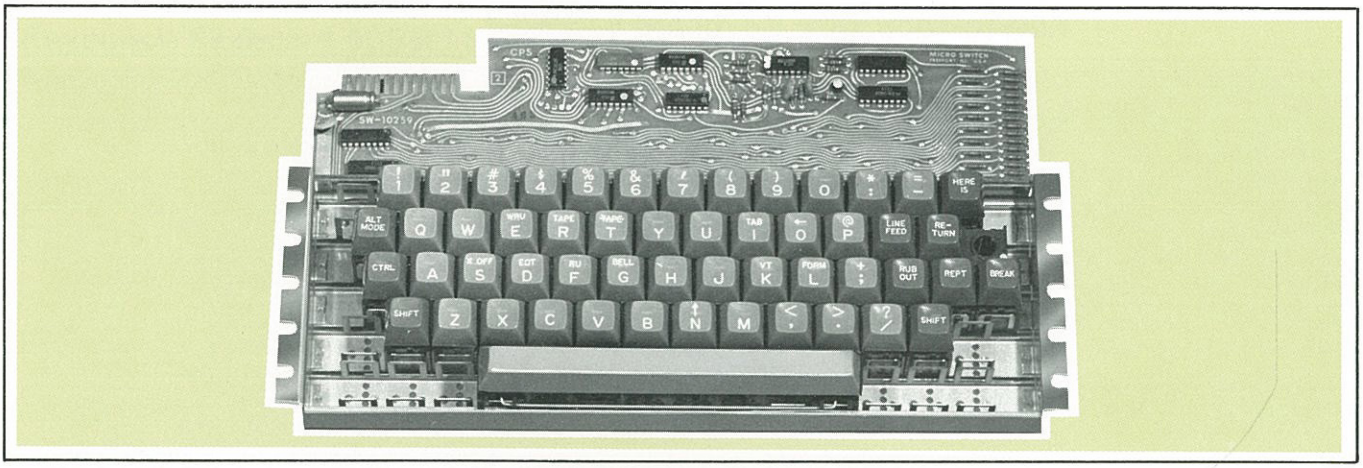
We have established the following general-sales listings to meet general requirements with off-the-shelf keyboards. These keyboards can be used for prototype and evaluation purposes and in some cases they may meet the requirements of your production. However, it is our intention to work with you in specifying keyboards that are exactly suited to your needs and at the most economical price possible where production quantities are involved. The first group of keyboards are designed for use with communications equipment such as CRT displays and teleprinters. The features and options that are incorporated into these listings are typical of the market needs. The same is true of the second group of keyboards which are designed for use with source data equipment such as key-to-tape/disc, key punch, and remote batch terminals. For more detailed description of any stock keyboard, request a product sheet on the particular listing from your nearest MICRO SWITCH Branch Office.

COMMUNICATIONS KEYBOARDS

Teleprinter Keyboard 63SW5-4

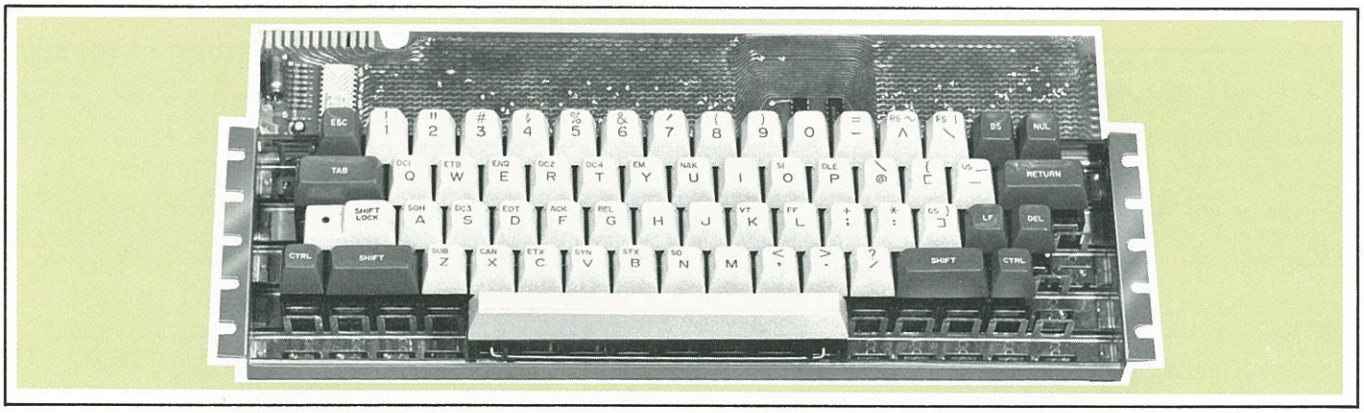
- USASCII Code (All 128 characters)
- 3 modes of operation
- One-character storage
- Two-key rollover
- Key row offset $\frac{3}{8}$-$\frac{3}{16}$-$\frac{3}{8}$
- Keyboard disable
- Error signal
- Alternate-action shiftlocks
- Sloped button orientation

Teleprinter Keyboard 53SW1-2



- USASCII Code
- Familiar "Model 33" key array
- Four modes of operation
- Two-key rollover
- Sloped button orientation
- Key row offset ⅜-3/16-⅜

Communications Keyboard 61SW12-1



- USASCII Code (all 128 characters)
- N-key rollover
- Sculptured buttons
- Electronic shiftlock . . . with lighted key
- Key row offset ⅜-3/16-⅜

Communications Keyboard 75SW12-2

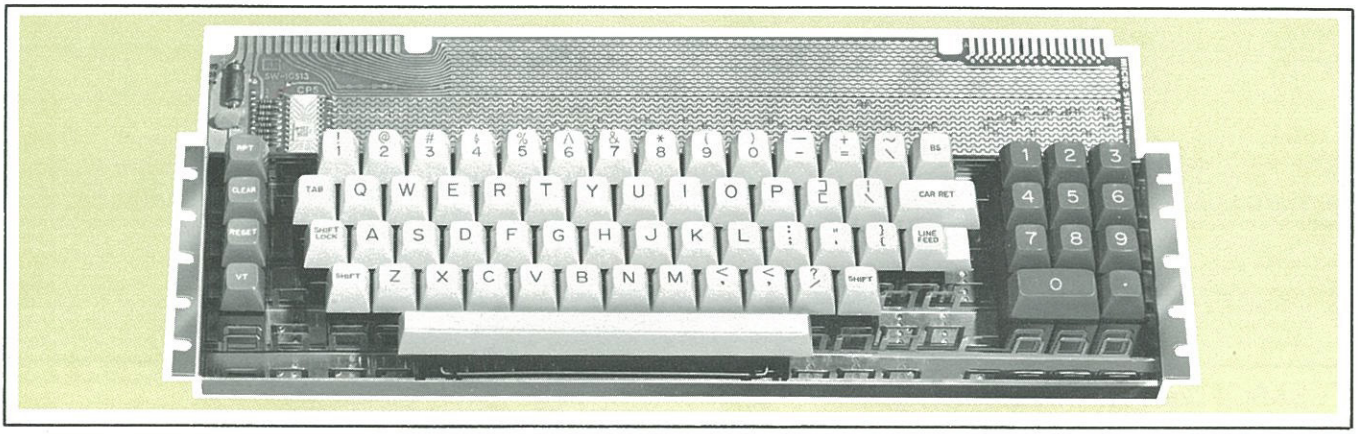
- USASCII Code
- Electric typewriter character pairing
- N-key rollover
- Sculptured buttons
- Alternate-action shiftlock
- Control characters in block array
- Key row offset (touch typing array) ⅜-3/16-⅜

SOURCE DATA KEYBOARDS

Key-To-Tape/Disc Keyboard 51SW5-1

- EBCDIC Code
- Four modes of operation
- One-character storage
- Two-key rollover
- Error indication
- System control
- Sloped button orientation
- Key row offset ⅜-⅜-⅜

Remote Batch Keyboard 70SW12-1



- USASCII Code
- Two modes of operation
- One-character storage
- N-key rollover
- Sculptured buttons
- Key row offset ⅜-3/16-⅜

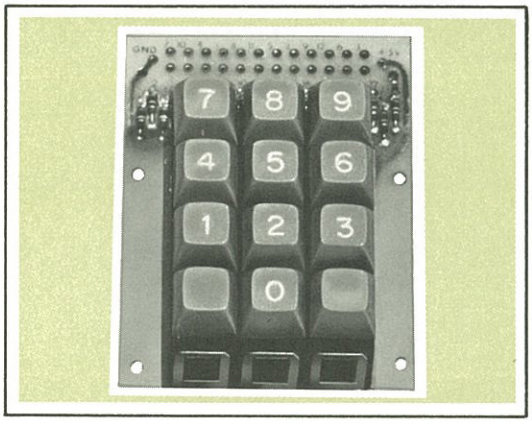
Typewriter Keyboard 51SW12-1

- Six-bit address Code
- Mono mode
- One-character storage
- N-key rollover
- Secretary shiftlock
- Sculptured buttons
- Key row offset ⅜-3/16-⅜

Keypunch Keyboard 50SW11-50

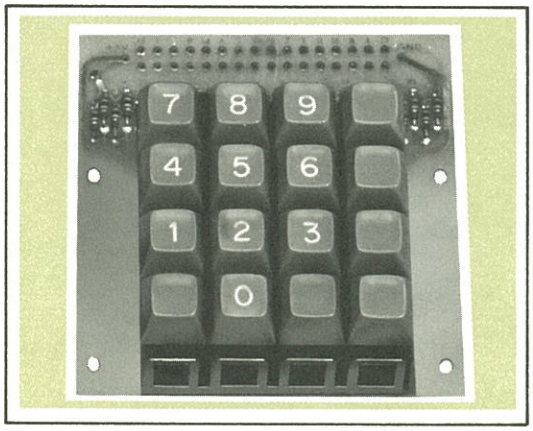
- System 3 Code
- Two modes of operation
- N-key rollover
- System control
- Key row offset ⅜-⅜-⅜
- One-character storage
- Pulsed function lines
- Sloped button orientation

Current Sinking Non-Encoded Keyboard 12SW Series



- Level or pulsed outputs
- Available with or without buttons
- Gang mounting . . . up to 24 stations
- Two-shot molded or relegendable buttons available

Current Sinking Non-Encoded Keyboard 16SW Series



- Level or pulsed outputs
- Available with or without buttons
- Gang mounting . . . up to 32 stations
- Two-shot molded or relegendable buttons available

Ordering Information

Contact our branch offices for complete ordering and application assistance. Our field engineers are ready to work with you in specifying keyboards that are best for your application.

Branch Offices

Atlanta, Georgia 30329
6 West Druid Hills Drive, N.E.
404/631-3321

Binghamton, New York 13901
1200 Arterial Hwy.
607/723-7993

Boston Office
Bedford, Massachusetts 01730
4 Preston Court
617/275-2440

Chicago Office
Skokie, Illinois 60076
Suite 100
4849 West Golf Road
312/478-9266

Cleveland, Ohio 44103
1001 East 55th Street
216/881-0300

Dallas, Texas 75206
6000 North Central Expressway
214/363-5441

Davenport Office
Bettendorf, Iowa 52722
1810 State Street
319/355-6456

Dayton, Ohio 45404
2314 Stanley Avenue
513/461-4480

Denver Office
Englewood, Colorado 80110
7825 E. Prentice Avenue
303/771-2340

Detroit Office
Southfield, Michigan 48075
17515 W. Nine Mile Road
313/352-1900

Hartford, Connecticut 06101
885 Wethersfield Avenue
203/527-0178

Houston, Texas 77042
8440 Westglen Drive
713/785-3200

Indianapolis, Indiana 46241
5739 Professional Circle
317/243-0831

Kansas City, Missouri 64133
8401 East 50 Highway
816/358-4200

Long Island City, New York 11101
24-30 Skillman Avenue
212/786-5005

Los Angeles, California 90040
6620 Telegraph Road
213/723-6611

Memphis, Tennessee 38131
2005 Nonconnah Boulevard
901/396-6222

Milwaukee, Wisconsin 53222
2979 North Mayfair Road
414/771-6300

Minneapolis, Minnesota 55435
Twin City Branch
7400 Metro Blvd.
612/835-5400

Philadelphia Office
Blue Bell, Pennsylvania 19422
Merion-Towle House
1777 Walton Road
215/643-5820

Rochester, New York 14623
100 Metro Park
716/461-1600

St. Louis Office
Creve Coeur, Missouri 63141
10000 Old Olive Street Road
314/991-4100

San Francisco Office
Sunnyvale, California 94086
910 Thompson Place
408/732-0120

Seattle Office
Mercer Island, Washington 98040
9555 S.E. 36th Street
206/232-5030

Syracuse Office
Liverpool, New York 13088
7485 7th North Street
315/451-4000

Washington, D.C. Office
McLean, Va. 22101
1766 Old Meadow Lane
703/893-4660

Westchester Office
Elmsford, New York 10523
570 Taxter Road
914/592-3200

Westfield, N.J. 07090
574 Springfield Avenue
201/233-9200

Wichita, Kansas 67216
2801 South Madison
316/522-3435

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MICRO SWITCH
FREEPORT, ILLINOIS 61032
A DIVISION OF HONEYWELL

IN CANADA: 740 Ellesmere Road, Scarborough, Ontario. INTERNATIONAL: Sales and service offices in all principal cities of the world.

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